Mensch-Maschine-Interaktion 2
Übung 2

Ludwig-Maximilians-Universität München

Wintersemester 2012/2013

Alexander De Luca, Aurélien Tabard

Nielsen's Heuristics

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Arbeitsgruppen Medieninformatik und Mensch-Maschine-Interaktion

Die Arbeitsgruppen Medieninformatik und Mensch-Maschine-Interaktion des Instituts für Informatik der LMU München setzen sich zusammen aus dem Lehrstuhl für Angewandte Informatik und Medieninformatik (Prof. Dr. Heinrich Hußmann) sowie dem Lehrstuhl für Mensch-Maschine-Interaktion (Prof. Dr. Andreas Butz). Zusammen mit den anderen Lehrstühlen des Instituts betreuen wir den Studiengang Medieninformatik an der LMU.

Aktuelles

- 11.10.2012: **Masterprogramm**
  Für alle angehenden Master-Studenten wird auf die "Einführungsveranstaltung Master Medieninformatik" am kommenden Montag,den 15.10 verwiesen.
- 9.10.2012: **Lehre**
  Das Seminar und Praktikum Wissenschaftliches Arbeiten und Lehren fehlte bisher in den Lehrplänen. Es ist ab sofort verfügbar.
- 1.10.2012: **Absolventenfeier**
  Am Freitag, den 26. Oktober 2012 ab 17.30 Uhr findet die Absolventenfeier der Informatik 2012 statt. Dazu sind die Studenten aller Semester herzlich eingeladen.
- 20.09.2012: **Stellenangebot**
  Wir suchen Tutoren für MMN im WS2012/2013. Interessenten melden sich bitte bei Alina Hang
- 5.6.2012: **Masterprogramm**
  Ab dem Wintersemester 2012/2013 bieten wir den Masterstudiengang Mensch-Computer-Interaktion an. Dieser kann prinzipiell als Medieninformatik mit Anwendungsfach Mensch-Maschine-Interaktion verstanden werden. Erste Informationen hierzu finden sich unter Semesterplanung und Master-Studiengänge; die Studienordnung ist noch nicht verfügbar.
- 23.12.2011: **Social Media**
  Wir haben unsere Webseite um ein Blog - gefüllt mit Projekten und Events rund um unseren Lehrstuhl und den Studiengang Medieninformatik - erweitert: http://www.medien.ifi.lmu.de/blog
- 30.5.2011: **Abschlussarbeiten**
  Informationen zur Vergabe und Bearbeitung von externen Bachelor- und Masterarbeiten finden sich auf dem Merkblatt des Instituts für Informatik

Social Media

Lost im Frost http://t.co/8MaUih7B 3 days ago

Neuer Logowettbewerb. Diesmal für die TEI 2014. http://t.co/AfD3vvCE 2 weeks ago

Also find us on facebook! http://t.co/m0z7PYaW 2 weeks ago

Videos

Vorlesungen

- Digitale Medien
- Information Visualization
- Mensch-Maschine-Interaktion 2
- Multimedia im Netz

Seminare

- Disputationsseminar Bachelor
- Disputationsseminar Master
- Hauptseminar Medieninformatik
- Seminar Persönliche und Soziale Kompetenz

Praktika

- Design Workshop 1
- Design Workshop 2
- Blockpraktikum Concept Development

Lehrplanen. Es ist ab sofort verfügbar.

- 1.10.2012: **Absolventenfeier**
  Am Freitag, den 26. Oktober 2012 ab 17.30 Uhr findet die Absolventenfeier der Informatik 2012 statt. Dazu sind die Studenten aller Semester herzlich eingeladen.
- 20.09.2012: **Stellenangebot**
  Wir suchen Tutoren für MMN im WS2012/2013. Interessenten melden sich bitte bei Alina Hang
- 5.6.2012: **Masterprogramm**
  Ab dem Wintersemester 2012/2013 bieten wir den Masterstudiengang Mensch-Computer-Interaktion an. Dieser kann prinzipiell als Medieninformatik mit Anwendungsfach Mensch-Maschine-Interaktion verstanden werden. Erste Informationen hierzu finden sich unter Semesterplanung und Master-Studiengänge; die Studienordnung ist noch nicht verfügbar.
- 23.12.2011: **Social Media**
  Wir haben unsere Webseite um ein Blog - gefüllt mit Projekten und Events rund um unseren Lehrstuhl und den Studiengang Medieninformatik - erweitert: http://www.medien.ifi.lmu.de/blog
- 30.5.2011: **Abschlussarbeiten**
  Informationen zur Vergabe und Bearbeitung von externen Bachelor- und Masterarbeiten finden sich auf dem Merkblatt des Instituts für Informatik.
- 17.9.2009: **Publikationen**
  Prof. Butz und Prof. Hußmann haben zusammen mit Prof. Malaka von der Uni Bremen ein einführendes Lehrbuch der Medieninformatik verfasst, das ab sofort im Buchhandel erhältlich ist.
- 23.10.2008: **Prüfungsordnung**
  Eine neue Fassung der Zuordnung von Lehrveranstaltungen zu Prüfungsfächern in den Diplom-Prüfungen Medieninformatik ist online.

Vorlesungen

- Digitale Medien
- Information Visualization
- Mensch-Maschine-Interaktion 2
- Multimedia im Netz

Seminare

- Disputationsseminar Bachelor
- Disputationsseminar Master
- Hauptseminar Medieninformatik
- Seminar Persönliche und Soziale Kompetenz

Praktika

- Design Workshop 1
- Design Workshop 2
- Blockpraktikum Concept Development
- Praktikum 3D-Modellierung mit Blender
- Praktikum Entwicklung von Mediensystemen
- Projektkompetenz Multimedia: Unreal Development
- Praktikum Mediengestaltung
- Kurs Zeichnen und Skizzieren von Szenarien
- Kurs Programmierung mit Kinect

Arbeitskreise

- Arbeitskreis 3D
- Arbeitskreis Digitalfotografie
- Arbeitskreis Musik

LFE-Stundenplan (nicht-offiziell!)

Veranstaltungen

- Einführungsveranstaltung Master Medieninformatik
- Absolventenfeier der Informatik 2012

Forschung

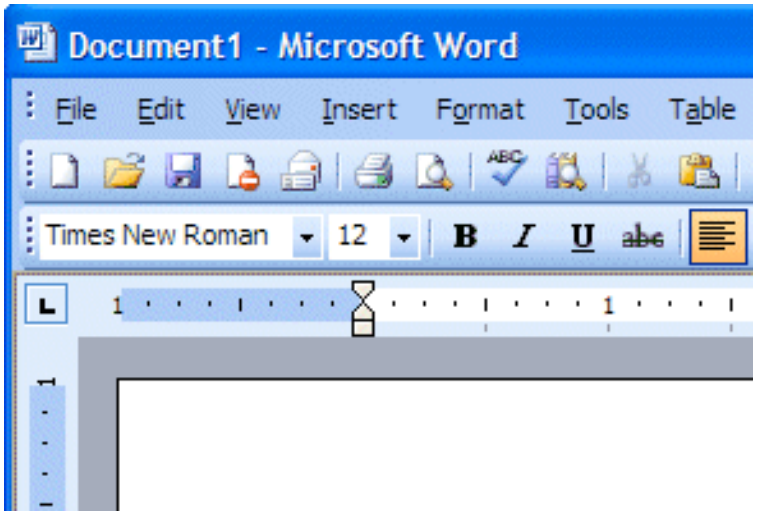
- Publikationen
- Technische Berichte
- Konferenzen & Workshops

Heuristics

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

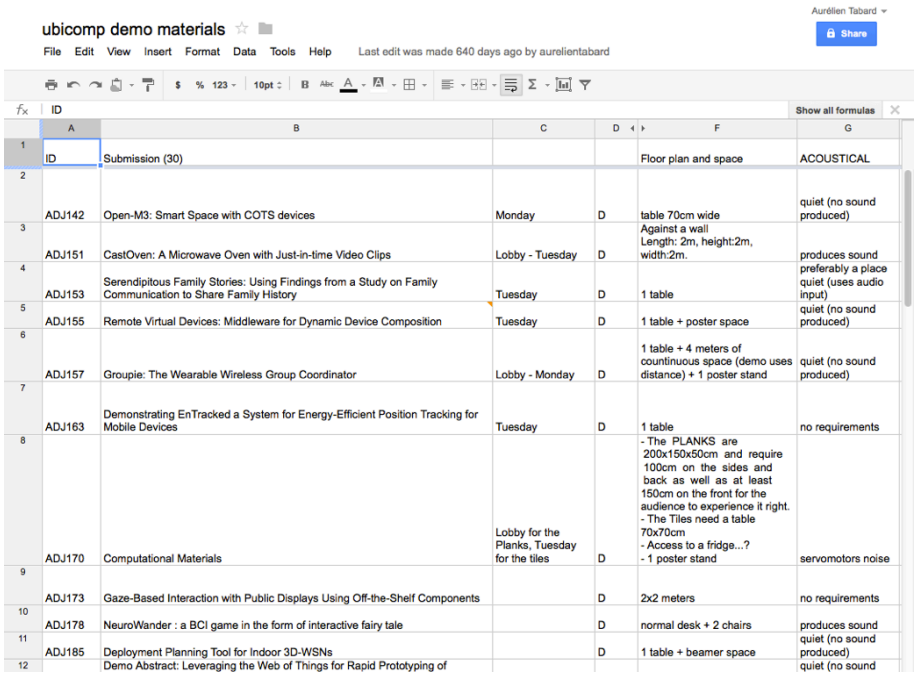
Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



ubicomp demo materials

File Edit View Insert Format Data Tools Help Last edit was made 640 days ago by aurelientabard

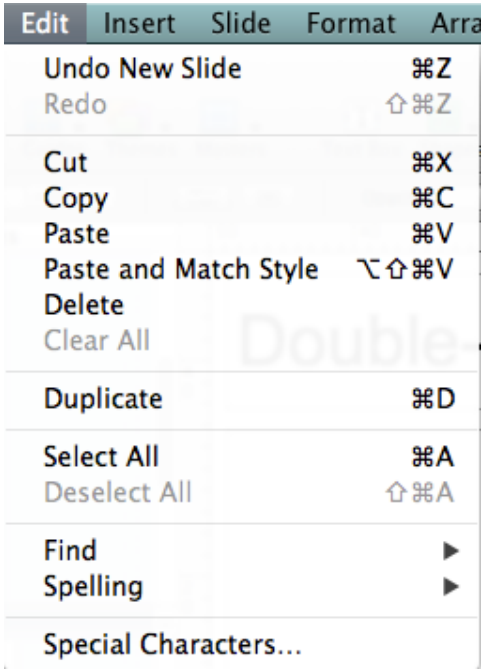
Aurélien Tabard — Share

Show all formulas

	A	B	C	D	F	G
1	ID	Submission (30)			Floor plan and space	ACOUSTICAL
2	ADJ142	Open-M3: Smart Space with COTS devices	Monday	D	table 70cm wide	quiet (no sound produced)
3	ADJ151	CastOven: A Microwave Oven with Just-in-time Video Clips	Lobby - Tuesday	D	Against a wall Length: 2m, height:2m, width:2m.	produces sound
4	ADJ153	Serendipitous Family Stories: Using Findings from a Study on Family Communication to Share Family History	Tuesday	D	1 table	preferably a place quiet (uses audio input)
5	ADJ155	Remote Virtual Devices: Middleware for Dynamic Device Composition	Tuesday	D	1 table + poster space	quiet (no sound produced)
6	ADJ157	Groupie: The Wearable Wireless Group Coordinator	Lobby - Monday	D	1 table + 4 meters of countinuous space (demo uses distance) + 1 poster stand	quiet (no sound produced)
7	ADJ163	Demonstrating EnTracked a System for Energy-Efficient Position Tracking for Mobile Devices	Tuesday	D	1 table	no requirements
8	ADJ170	Computational Materials	Lobby for the Planks, Tuesday for the tiles	D	- The PLANKS are 200x150x50cm and require 100cm on the sides and back as well as at least 150cm on the front for the audience to experience it right. - The Tiles need a table 70x70cm - Access to a fridge...? - 1 poster stand	servomotors noise
9	ADJ173	Gaze-Based Interaction with Public Displays Using Off-the-Shelf Components		D	2x2 meters	no requirements
10	ADJ178	NeuroWander : a BCI game in the form of interactive fairy tale		D	normal desk + 2 chairs	produces sound
11	ADJ185	Deployment Planning Tool for Indoor 3D-WSNs		D	1 table + beamer space	quiet (no sound produced)
12		Demo Abstract: Leveraging the Web of Things for Rapid Prototyping of				quiet (no sound

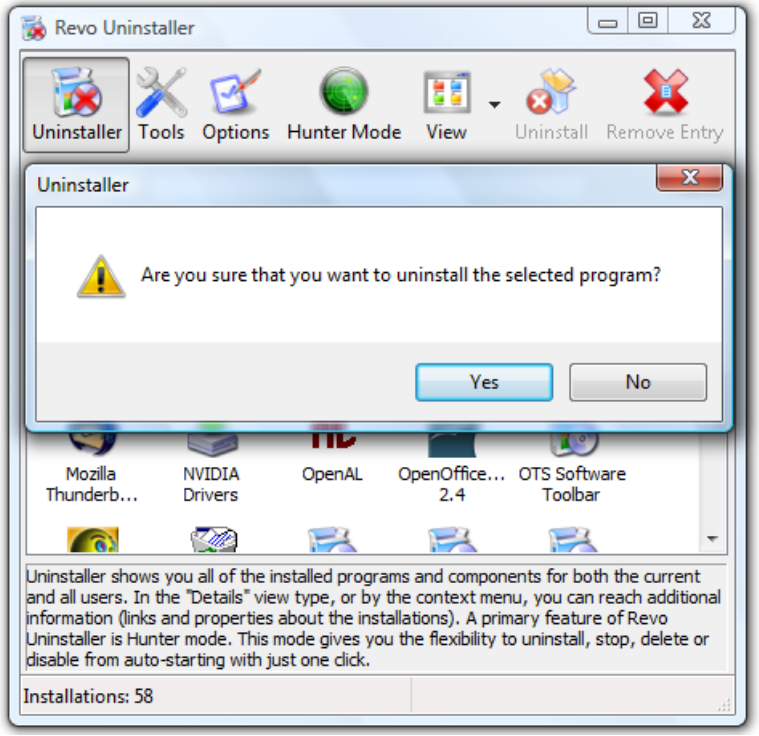
Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



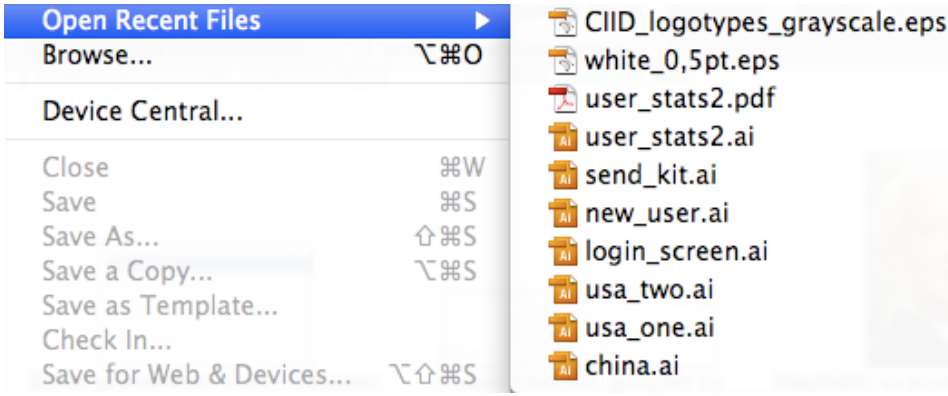
Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



Heuristic

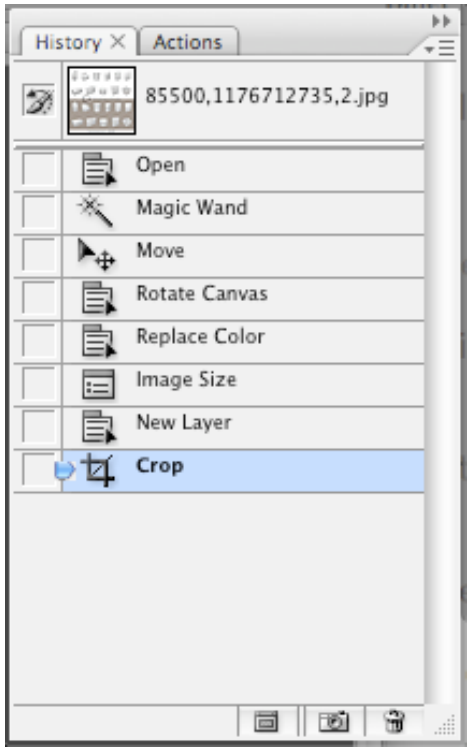
1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

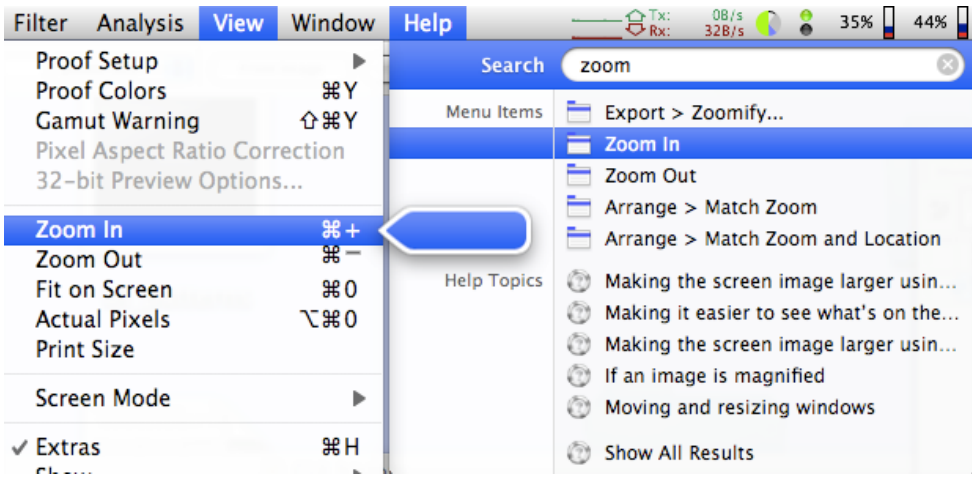
Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



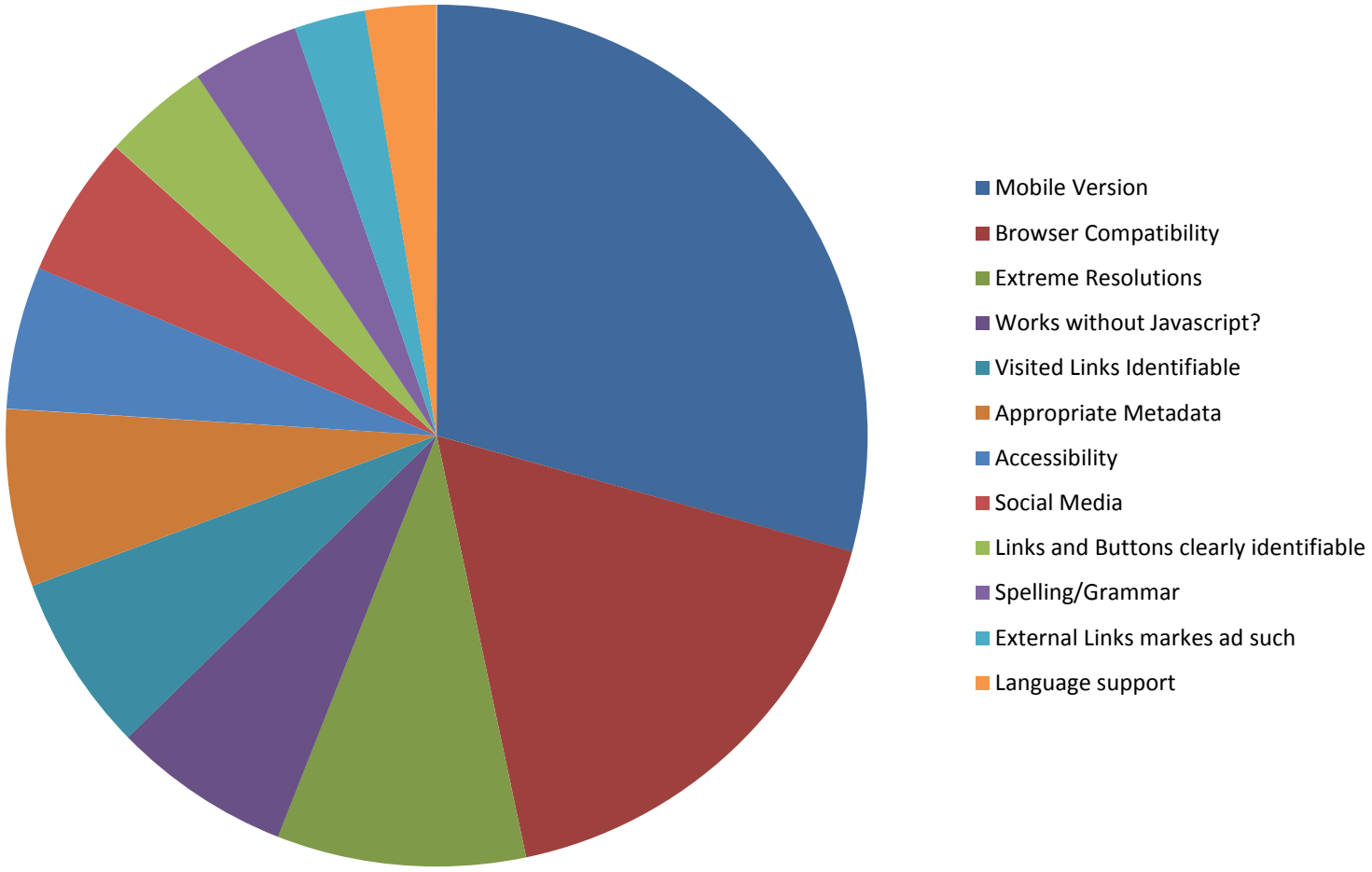
Heuristic

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation



Exercise 1 b) (out of 53 solutions)

- Mobile Version (adaptive to different display sizes/properties)? 22
- Browser compatibility? 13
- Small or extreme screen resolutions? 7
- Does the page work without Javascript ? 5
- Visited links clearly identified? 5
- Metadata? 5
- Social media? 4
- Accessibility? 4
- Links and buttons clearly identifiable? 3
- Spelling, grammar? 3
- External links marked as such? 2
- Supports different languages? 2
- More options to rate the points (more than 3) 2
- Search Quality? 2


Mobile Version
Browser Compatibility
Extreme Resolutions
Works without Javascript?
Visited Links Identifiable
Appropriate Metadata
Accessibility
Social Media
Links and Buttons clearly identifiable
Spelling/Grammar
External Links markes ad such
Language support

Today

Designing and Evaluating Experiments

Goals of experiments

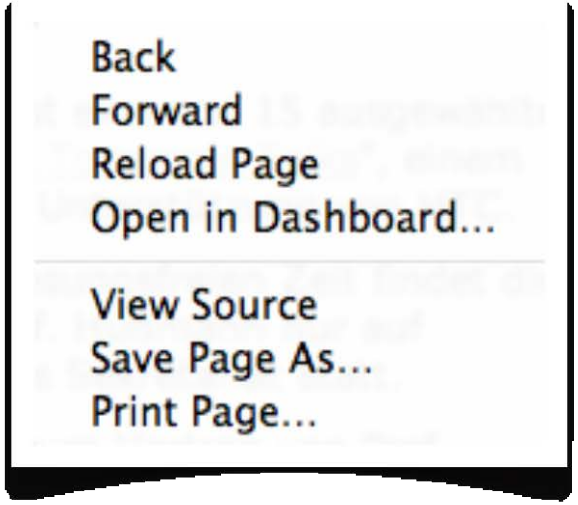
Goal: Find causal links between variables

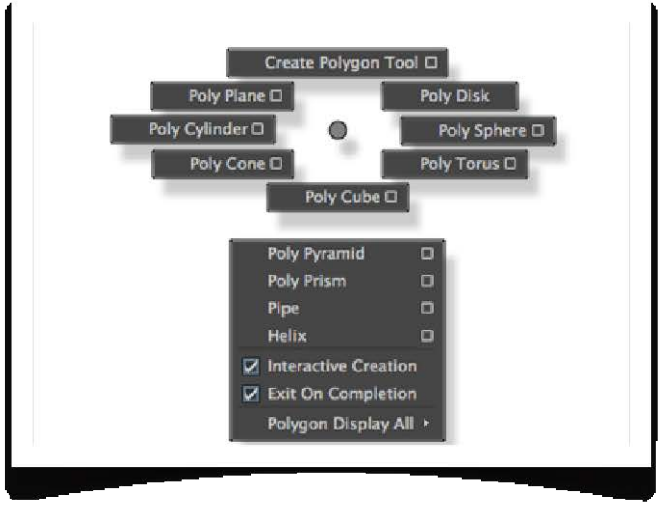
Precondition: Cause has to precede effect

How to infer causality:

- Two controlled conditions
    - Cause is present (experimental condition)
    - Cause is absent (control condition)

Comparing two menu designs

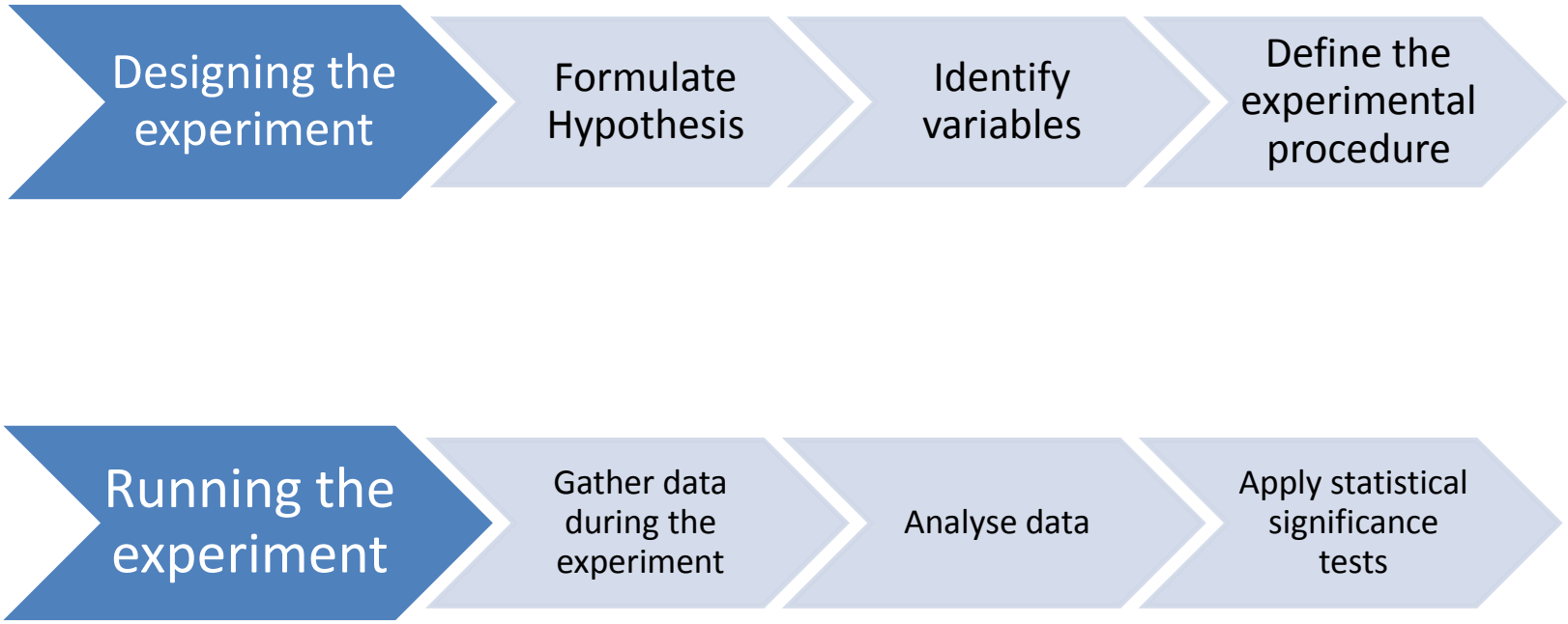




Finding out the best sign-up button for your website

http://dmix.ca/2010/05/how-we-increased-our-conversion-rate-by-72/

Experimental process



Hypotheses

- Prediction of the result:
  - „how will the *independant variables* affect the *dependent variables*?“
- Hypotheses must be formulated before running the study
  - By doing the experiment, the hypotheses is either proved or disproved

Variables and data

1. Factors (= **independent** variables).
   - *“What do I change?”*
   - Traffic light can be *red*, *yellow* or *green* (3 levels)

2. Measures or responses (= **dependent** variables).
   - *„What do I observe?“*
   - Outcomes of experiment, measured in the user study

3. Replication
   - i.e. number of subjects assigned to each level

Independent Variables

- The conditions of the experiment are set by independent variables
  - The number of items in a list, text size, font, color
- The number of different values used is the **level**
  - The number of experimental conditions is the product of the levels
  - E.g., font can be times or arial (2 levels) background can be blue, green, or white (3 levels). This results in 6 experimental conditions (times on blue, times, on green, ..., arial on white)

Dependent Variables

- The dependent variables are the values to be measured:
  - Objective values: e.g. time to complete a task, number of errors, etc.
  - Subjective values: ease of use, preferred option, etc.
  - They should only be dependent on changes of the independent variables.

Study Designs

Design types

- Within subject („repeated measures“)
  - Each subject is exposed to all conditions
  - The order of conditions must be randomized to avoid ordering effects

- Between groups („independent measures“)
  - Separate groups (participants) for each condition
  - Careful selection of groups is essential

- Hybrid („mixed“) designs

Participants

- Should be representative for the target group
- Avoid bias (e.g. not only men, students)
- Choose the right sample size

Principles

The results of the experiment should be

1. **Valid**
   - Measurements are accurate and due to manipulations (**internal validity**)
   - Findings are representative and not only valid in the experiment setting (**external validity**)
2. **Reliable**
   - Consistency of measurement
   - A persons score doing the same test under the same conditions twice must be similar
3. **Generalizable**
   - Results should be valid for all people
   - Test users must be representative

Validity

- Internal validity:
  - Manipulation of independent variable is cause of change in dependent variable
  - Requires removing effects of confounding factors
  - Requires choosing a large enough sample size, so the result couldn't have happened by chance alone.
- External validity
  - Results generalize to real world situations
  - Requires that the experiment be replicable
  - No study "has" external validity by itself!

Qualitative vs. Quantitative Data

- deals with descriptions
- data can be observed but not measured
- colors, textures, smells, tastes, etc.
- Qualitative -> Quality

- deals with numbers
- data which can be measured
- length, height, area, volume, speed, costs etc.
- Quantitative -> Quantity

Oil Painting

Qualitative data:

- blue/green color, gold frame
- smells old and musty
- texture shows brush strokes of oil paint
- peaceful scene of the country

Oil Painting

Quantitative data:

- picture is 40 cm by 60 cm
- with frame 45 cm by 65 cm
- weighs 4 kilogramm
- costs 300€

Types of Data

From [1]

- Nominal
- Ordinal

non-parametric

- Interval
- Ratio

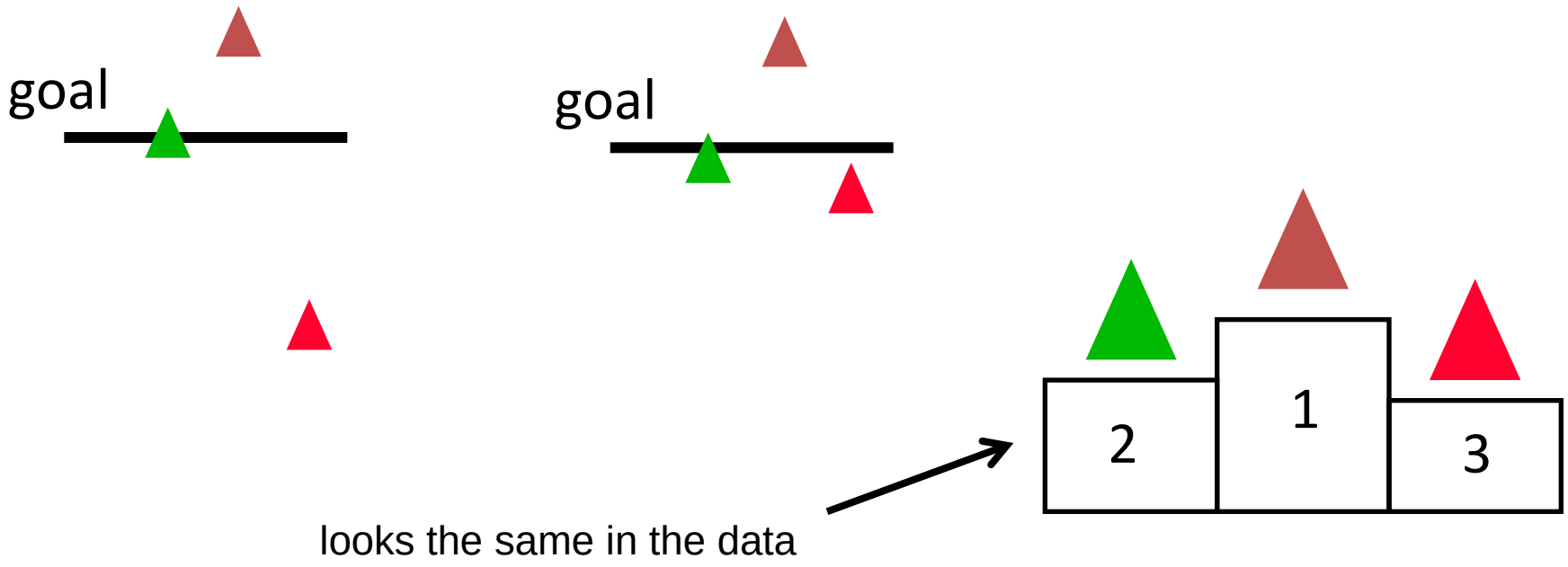
parametric

more information

Ordinal vs. Interval

- ordinal provides an order
- doesn‘t tell anything about the differences

- example: triangle race



Likert Scales

- used to „measure“ opinions
- participants give ratings
- Attention: there is a huge discussion going on whether likert scale data is ordinal (non-parametric) or interval (parametric)*

centered

1. fully agree
2. agree
3. neutral
4. disagree
5. totally disagree

uncentered

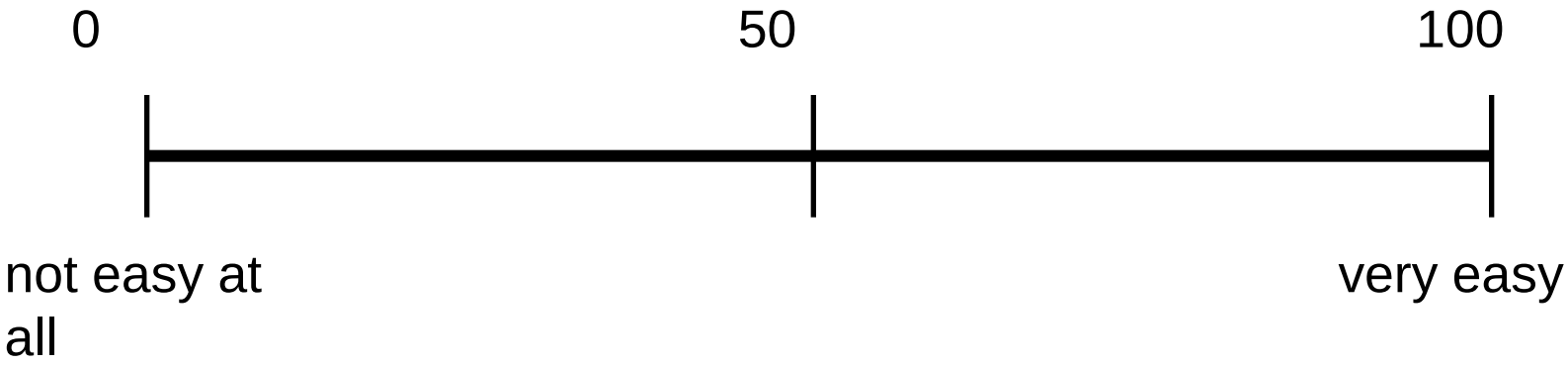
1. fully agree
2. agree
3. disagree
4. totally disagree

* Computer scientists believe it is ordinal. Please read the following blog entry for information and implications: http://cacm.acm.org/blogs/blog-cacm/107125-stats-were-doing-it-wrong/fulltext

Visual-Analog Rating Scales

- no categories
- advantage: users cannot remember their response

How easy to use was the prototype?

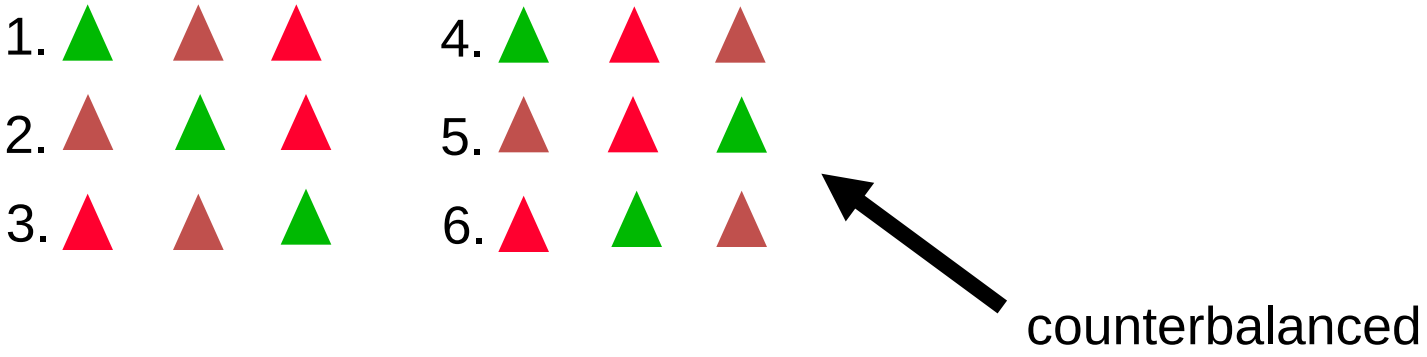


Learning Effect

- people get better over time
- to avoid influences on the experiment:
  - use perfect counterbalancing if possible
  - Latin square designs
  - randomization
  - other designs

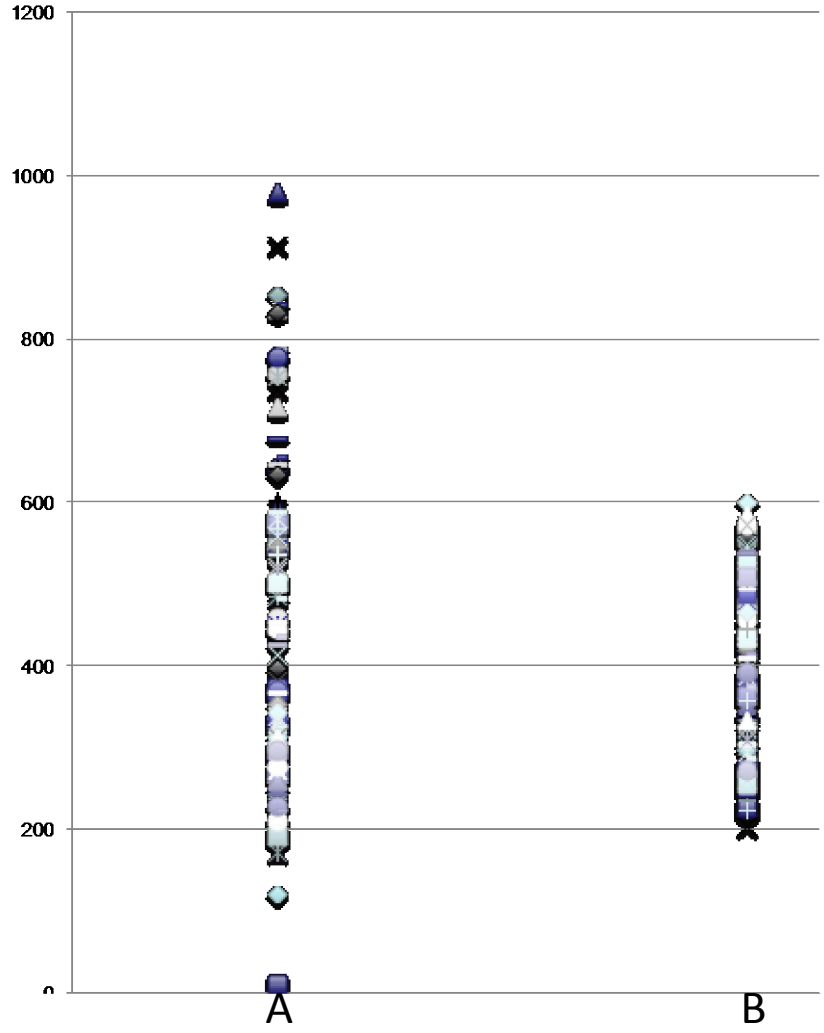
better

Example: One variable with 3 levels. 3! = 6 arrangements.



Analyzing Experimental Data

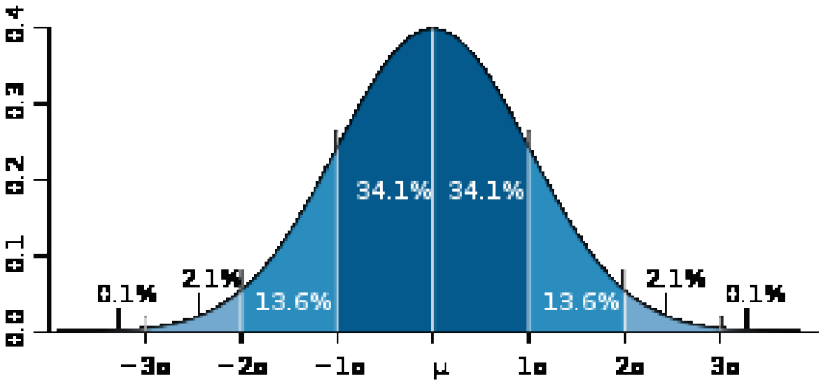
Is A faster than B?



- are these two means significantly different?
- depends on difference between means
- depends also on spread (i.e. standard deviation)
- depends also on sample size

Student's t-test

- Looks at the relationship between two data sets
- Designed for:
  - small sample (= few measurements)
  - unknown (mean and) standard deviation
  - but has to be normally distributed



T-test

- Gives p: the probability (i.e., $0 < p < 1$) you got the difference between two data sets is due to chance
- A low probability (< 0.05) means “unlikely that this difference in means was the result of chance reject null hypothesis”
- The risk of erroneously rejecting the null hypothesis (= supporting the hypothesis) is less than percentage p.
- In our field usually 0.05 (= 5% chance).

DON'T

- If p>0.05 say:
  "our tests showed that there was no difference".

- significant difference -> impact
- no significant difference -> nothing

- You cannot show that there is no difference!

Analysis

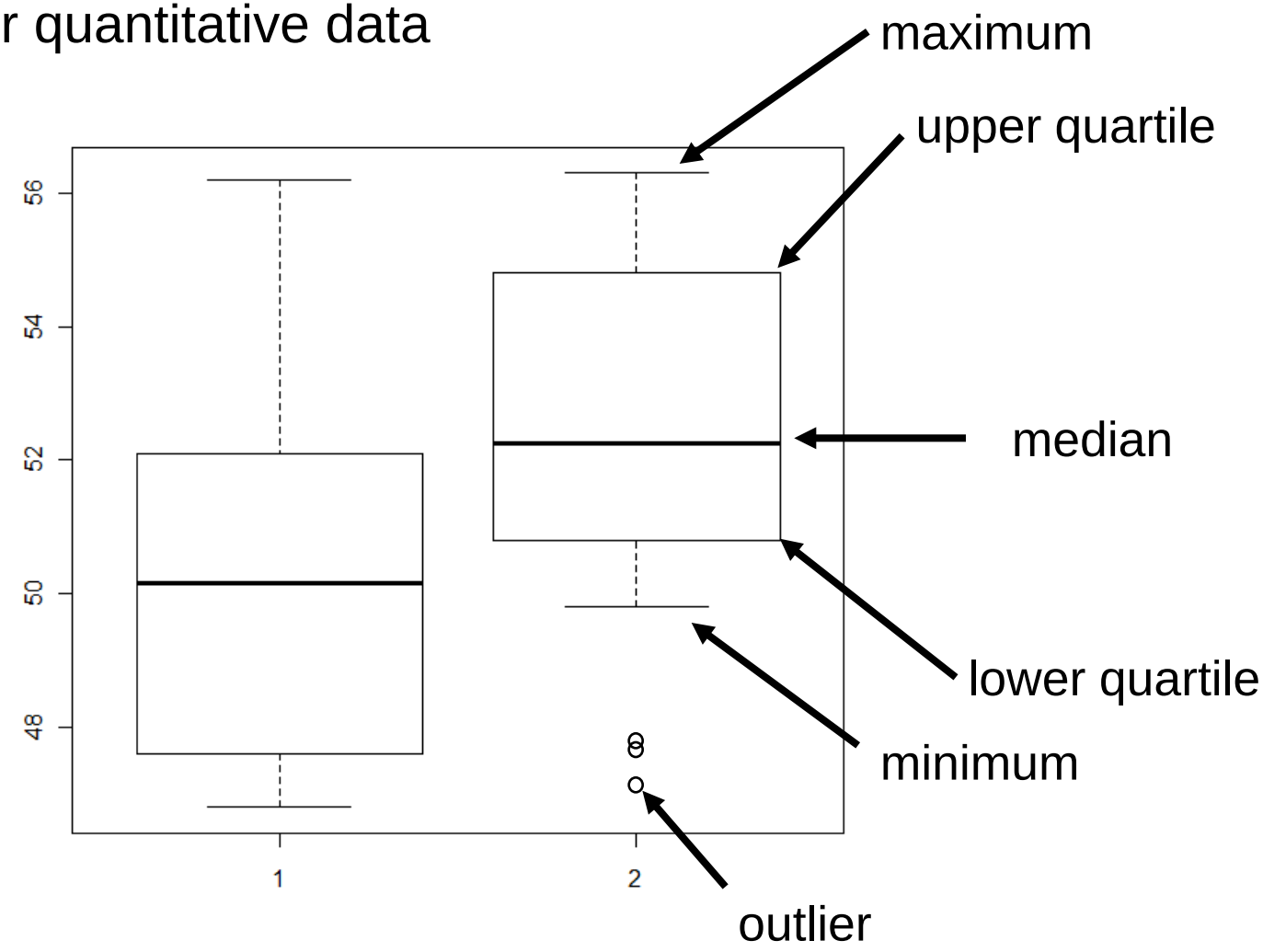
- Choose the right statistical tests
  - Heavily influenced by the choice of measurement tools
  - … and the types of data used
  - Parametric tests (e.g. ANOVA, T-Test) vs. non-parametric tests (e.g. Wilcoxon, Kruskal-Wallis)

- Choose the right visualization

Presenting Results

Boxplot

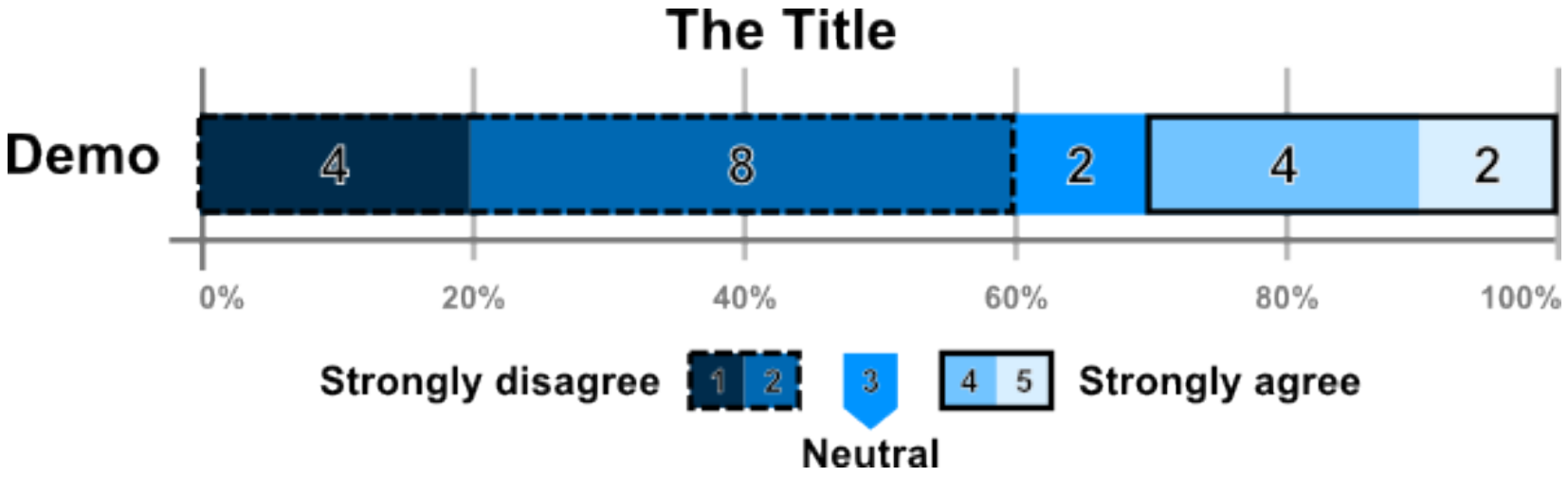
good for quantitative data



Likert Scales?

- Don‘t report the mean
- If possible, report and visualize frequencies

- For example:



Visualization by Max Maurer. Script available here http://www.paje-systems.de/likert/

References

1. Field, A., Hole, G. How to Design and Report Experiments. (book)